SERVICE MANUAL

240 VOLT
ELECTRONIC LOAD MODULE
Agilent 60503B

Part No. 60503-90009

SERVICE MANUAL
FOR INSTRUMENTS WITH SERIAL NUMBERS
US37250101

For instruments with higher Serial Numbers,
a change page may be included.

Microfiche Part No. 60503-90010

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CERTIFICATION

Agilent Technologies certifies that this product met its published specifications at time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

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THE REMEDIES PROVIDED HEREIN ARE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT TECHNOLOGIES SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

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The above statements apply only to the standard product warranty. Warranty options, extended support contracts, product maintenance agreements and customer assistance agreements are also available. Contact your nearest Agilent Technologies Sales and Service office for further information on Agilent Technologies' full line of Support Programs.

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

BEFORE APPLYING POWER.
Verify that the product is set to match the available line voltage and the correct fuse is installed.

GROUND THE INSTRUMENT.
This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the ac power supply mains through a three-conductor power cable, with the third wire firmly connected to an electrical ground (safety ground) at the power outlet. For instruments designed to be hard-wired to the ac power lines (supply mains), connect the protective earth terminal to a protective conductor before any other connection is made. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury. If the instrument is to be energized via an external autotransformer for voltage reduction, be certain that the autotransformer common terminal is connected to the neutral (earth pole) of the ac power lines (supply mains).

FUSES.
Only fuses with the required rated current, voltage and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.
Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS.
Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

DO NOT SERVICE OR ADJUST ALONE.
Do not attempt internal service or adjustment unless another person capable of rendering first aid and resuscitation, is present.

DO NOT EXCEED INPUT RATINGS.
This instrument may be equipped with a line filter to reduce electromagnetic interference and must be connected to a properly grounded receptacle to minimize electric shock hazard. Operation at line voltages or frequencies in excess of those stated on the line rating label may cause leakage currents in excess of 5.0 mA peak.

SAFETY SYMBOLS.

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents) .

Indicates hazardous voltages.

or

Indicate earth (ground) terminal.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Instruments which appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Table of Contents

General Information

About This Manual

This manual is designed to be used along with the Agilent 6050A/6051A Service Manual. It includes service information that is specific to the 60503B Module. Troubleshooting information such as fault isolation, signature analysis, and block-level troubleshooting is the same for all modules and is found in the Agilent 6050A/6051A Electronic Load Mainframe Service Manual. The mainframe Service Manual also explains how to safely disassemble and connect the module to the mainframe for troubleshooting.

Typically, you will need to refer to this manual when you are performing the verification routines, locating a test point on the component/test point diagram, referring to the schematics for additional troubleshooting information, and initializing the module after replacing the EEPROM.

You will also need to refer to this manual for identifying and locating replaceable parts. The parts list identifies all replaceable parts in the module, and the component/test point diagram identifies the location of all electrical parts in your module.

Troubleshooting Precautions

WARNING Use extreme caution when troubleshooting the module when it is connected to the mainframe. AC mains voltage is present on the exposed pins on the top edge of the mainframe GPIB board and each module whenever the units are turned on.

CAUTION Observe all standard antistatic procedures when handling the module assemblies to avoid the possibility of electrostatic damage (refer to mainframe Service Manual) .

To reduce the risk of electrical shock when troubleshooting a defective module, make sure the GPIB board is installed in the mainframe. Also, to make it easier to troubleshoot the module, connect the module to the GPIB board using an extender service cable (P/N 06050-60030). This cable is included with the Service kit (P/N 06050-60004), which must be ordered separately.

Manual Revisions

Agilent Technologies instruments are identified by a ten-character serial number such as US37250101. This manual was written for Electronic Load Modules with serial numbers equal to and higher than those shown on the title page. If the serial number of your module is higher than the one shown on the title page, then the module may have hardware or firmware differences that are not covered in this manual. If there are such differences, they are documented in one or more Manual Change sheets sent with this manual.

Module Initialization

EEPROM chip U342 on the Control Board stores the module's GPIB address and model number as well as other constants. The EEPROM was programmed with the proper constants at the factory. If the Control board or the EEPROM chip (U342) is replaced, the module must be reinitialized with the proper constants by programming the following commands in the order indicated. After it has been initialized, the module must also be recalibrated as described in the Operating Manual.

60503B Initialization

"CAL 1"	**! turn calibration mode on**
"CAL: INIT 240 , 10	**! initialize default calibration parameters**
"CAL:SAVE"	**! store calibration constants in EEPROM**
"DIAG:CAL:SEC -5033"	**! model number**
"DIAG: CAL: SEC 1 , 16896"	**! model number suffix**
"DIAG: CAL: SEC 26 , 1"	**! module width**
"DIAG: CAL: SEC 27 , 1"	**! module type**
"DIAG: CAL: SEC 28 , 5000"	**! voltage for soft over power**
"DIAG:CAL:SEC 29 , 5200"	**! current for soft over power**
"*RST"	**! reset factory default state**
"CURR : SLEW 0.167E6"	**! turn on slew rate**
"*SAV 0"	**! to location 0**
"CAL 0"	**! turn calibration mode off**

Verification

Introduction

This chapter contains test procedures that check the operation and calibration of an Agilent 60503A Electronic Load Module. The tests are performed from the front panel of an Agilent 6050A/6051A Electronic Load Mainframe with the module installed in slot 1. The tests can also be used to determine which circuits are faulty when troubleshooting. There are some transient, trigger, and pulse functions that require an GPIB controller and will not be verified with manual testing from the front panel. The following tests will verify, with a high level of confidence, that the module is operating properly without testing all of its capabilities.

At the end of this chapter are performance record tables where actual measured values can be recorded.

Test Equipment Required

Table 2-1 lists the test equipment required to perform the tests in this chapter. Test setups for the tests are shown in Figures 2-1 through 2-3. Make sure the sense switch on the rear of the module is set to the LCL position since local sensing is used in all of the test setups. Use adequate wire gauge when making connections (see Chapter 3 in the Operating Manual).

Note The Electronic Load must pass the selftest at power turn-on before the following tests can be performed. If the unit fails selftest, refer to the overall troubleshooting procedures in the mainframe Service Manual.

Table 2-1. Test Equipment Required for Verification

Type	Required Characteristics	Recommended Model
60V/60A Source	0 to 500V/0 to 5A 0 to 60V/0 to 50A	Agilent 6035A or equivalent Agilent 6032A or equivalent
Current Monitor Resistor	0.100 ohms @ 15A	9230/15 (Guildline Instruments)
Digital Voltmeter	dc accuracy of 0.01% 6 digit readout	Agilent 3455A, 3456A, or 3458A
Current Probe with Amplifier and Power Supply	Sensitivity of 1mA/10 mV to 50MHz with less than 300µA of noise to 5MHz.	Tektronix A6302 probe, AM503 probe amplifier, and TM501 probe power supply.
Oscilloscope	Sensitivity: 1mV Bandwidth: 20MHz	Agilent 54504

CC Mode Test

This test verifies that the module operates in the CC Mode and that the current programming and readback to the front panel display are within specifications. For each DMM reading, the front panel display should be equal to:

DMM reading in amps ± ((DMM reading in amps x 0.0012) + 0.010).

Note that if the test readings significantly disagree with the specified values or no readings can be recorded, perform the CC MODE TEST troubleshooting procedures in Figure 3-1 (sheet 2 of 3) in Chapter 3 of the mainframe Service Manual. If the readings are out of tolerance, calibrate the applicable current range (see Chapter 6 in the Operating Manual).

a. Connect the Electronic Load, power supply (Agilent 6032A or equivalent), DMM, and current monitor resistor (0.100 ohm) as shown in Figure 2-1.
b. Turn on the Electronic Load.
c. Check the high amp current range as follows:
   1. Press [MODE] [CURR] [Enter], then [CURR] [1] [0] [Enter] .
   2. Turn on the power supply and set for 5V and greater than 10 amps.
   3. Wait 30 seconds and then record the DMM and front panel display readings. DMM reading should be between 0.997V (9.975A) and 1.0025V (10.025A). Note that the Electronic Load's CC annunciator is on.
   4. Press [CURR] [1] [Enter] .
   5. Wait 10 seconds then record the DMM and front panel display readings. DMM reading should be between 98.85mV (0.988A) and 101.15mV (1.0115A).

d. Check the low current range as follows:
   1. Press [Range] [1] [Enter] then [CURR] [1] [Enter] .
   2. Wait 10 seconds then record the DMM and front panel display readings. DMM reading should be between 98.85mV (0.998A) and 101.15mV (1.011A.)
   3. Press [CURR] [0] [.] [1] [Enter] .
   4. Wait 10 seconds and record the DMM and front panel display readings. DMM reading should be between 8.985mV (89.85mA) and 11.015mV (110.15mA).

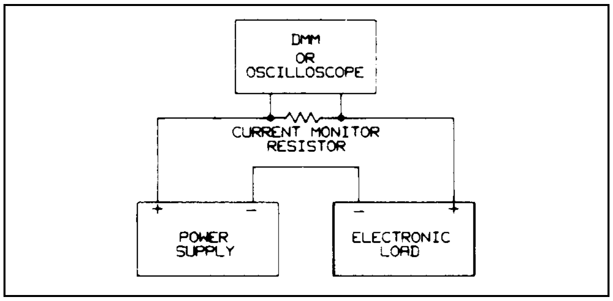


Figure 2-1. Test Setup A

CV MODE TEST

This test verifies that the module operates in the CV Mode and that the voltage programming and readback to the front panel display are within specifications. For each DMM reading, the corresponding front panel display should be equal to:

DMM reading +((DMM reading x 0.0010) + 0.150).

Note that if the test readings significantly disagree with the specified values or no readings can be recorded, perform the CV MODE TEST troubleshooting procedures in Figure 3-1 (sheet 2 of 3), in Chapter 3 of the mainframe Service Manual. If the readings are out of tolerance, calibrate the voltage range (see Chapter 6 in the Operating Manual).

a. Connect the Electronic Load, power supply (Agilent 6030A in series with Agilent 6032A or equivalent), and DMM as shown in Figure 2-2. Take care in making connections so that contact resistance voltage drop will not affect the readings.

b. Press [MODE] [VOLT] [Enter], then [VOLT] [2] [4] [0] [Enter].

c. Turn on and set power supply for 250V and 1A.

d. Record the DMM and front panel display readings. DMM reading should be between 239.59V and 240.408V. Note that the Electronic Load's CV annunciator is on.

e. Press [VOLT] [3] [Enter].

f. Record the DMM and front panel display readings. DMM reading should be between 2.876V and 3.123V.

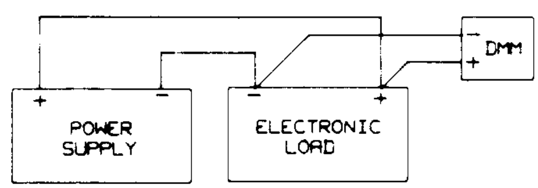


Figure 2-2. Test Setup B

CR MODE TEST

This test verifies that the module operates in the CR Mode and that the resistance programming is within specifications. The programmed resistance values are checked by recording the voltage across the current monitor resistor and the input voltage (voltage across the module's input terminals), and then calculating the resistance value as follows:

Load resistance = Input voltage/(voltage across resistor/resistor value)

Note if the calculation significantly disagrees with the specified range of values, perform the CR MODE TEST troubleshooting procedures in Figure 3-1 (sheet 3 of 3) in Chapter 3 of the mainframe Service Manual. If the calculation is out of tolerance, calibrate the applicable resistance range (see Chapter 6 in the Operating Manual).

a. Connect the Electronic Load, power supply (Agilent 6035A or equivalent), and current monitor resistor (0.100 ohm) as shown in Figure 2-1. Use the DMM to measure the voltage across the monitor resistor and across the module's input terminals.

b. Check the low ohm range as follows:
   1. Press [MODE] [RES] [Enter], then [Range] [1] [Enter], then [RES] [2] [4] [Enter].

   2. Turn on power source and set for 60V and 1.82A. For the low ohm range test, the power supply will operate in the current limit mode.

   3. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between 23.6 and 24.4 ohms. Note that the Electronic Load's CR annunciator is on.

   4. Press: [RES] [1] [Enter].

   5. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between 0.792 and 1.208 ohms.

c. Check the middle ohms range as follows:

   1. Press [Range] [2] [5], then [RES] [5] [0] [0] [Enter].

   2. Set power supply for 44V and 4A.

   3. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between 433 and 590 ohms.

   4. Press [RES] [2] [4] [Enter].

   5. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between 23.75 and 24.24 ohms.

d. Check the high ohms range as follows:

   1. Press: [Range] [2] [5] [0] [0] [0] [Enter], then [RES] [2] [0] [0] [0] [Enter].

   2. Set power source for 240V and 2A.

   3. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. Calculation should be between 1247 and 5037ohms.

   4. Press: [RES] [2] [4] [0] [Enter].

   5. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between 223 and 259 ohms.

Transient Operation and Slew Circuit Test

This test verifies transient and slew circuit operation. The slew circuits cannot be calibrated. If slew rise time and/or fall time are not within specifications or the slew circuits are inoperative, perform either the "Transient Generator Troubleshooting", or the "Slew Circuit Troubleshooting" in Chapter 3 of the mainframe Service Manual.

a. Use the test setup of Figure 2-1 except connect an oscilloscope across the 0.100 current monitor resistor in place of the DMM. Set power supply for 10V and 10A.

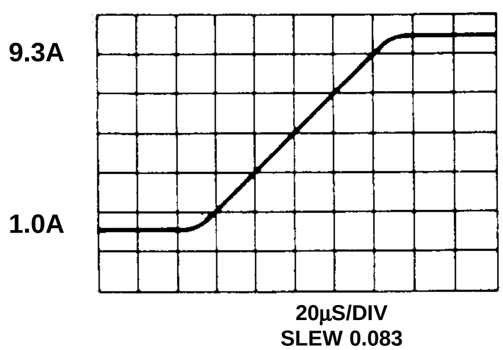
b. Recall the factory default values by pressing [Recall] [7] [Enter] .

c. Select the current range by pressing [Range] [6] [Enter] .

d. Set up transient operation by pressing [CURR] [1] [Enter] , then [Tran Level] [9] [·] [3] [Enter] .

e. Set the slew rate to 0.083A/µs (83A/ms) by pressing [ ] (blue shift key), then [Slew] [·] [0] [8] [3] [Enter] , then [Tran on/off] .

f. Adjust the oscilloscope for a single rise or fall time display. Use delayed sweep. The rise time when measures from 10% to 90% or the fall time when measured from 90% to 10% should be between 60 and 100µs as shown below. Note that the Electronic Load's **Tran** annunciator is on.



g. Set the slew rate to 0.0042A/µs (4.2A/ms) by pressing [ ] (blue shift key), then [Slew] [0] [·] [0] [0] [4] [2] [Enter] , then [Freq] [6] [0] [Enter] , then [Tran Level] [9] [·] [4] [Enter] .

h. Adjust the oscilloscope for a single rise or fall time display. Use delayed sweep. The rise time when measures from 10% to 90% or the fall time when measured from 90% to 10% should be between 1.2 and 2.0ms.

CC Mode PARD Test

CC mode PARD (periodic and random deviations) is specified as the rms input current in a frequency range 20Hz to 10Mhz. This test checks CC Mode PARD.

a. Connect the Electronic Load, power supply (Agilent 6032A or equivalent, DMM, and current probe as shown in Figure 2-3. Set power supply for 10V and greater than 10A.

b. Turn the load's ac power off then on.

c. Press [CURR] [1] [0] [Enter] .

d. DMM reading should be less than 1mA rms.

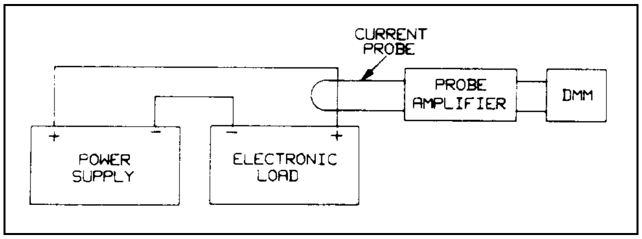


Figure 2-3. Test Setup C

CC MODE POWER LIMIT

This test verifies that the module's power limit circuit is operating properly. If the results specified in steps d through i are not obtained, troubleshoot the circuits as described in "Overpower Circuits Troubleshooting" in Chapter 3 of the mainframe Service Manual

CAUTION If the overpower circuit does not turn the load off within three minutes after performing step d, stop the tests and troubleshoot the overpower circuits.

a. Connect the Electronic Load and the power source as shown in Figure 2-2.

b. Turn on the Electronic Load and run for approximately five minutes with no power being dissipated (no input power).

c. Then press [MODE] [VOLT] [Enter], then [VOLT] [3] [5] [ENTER] .

d. Turn on and set the power supply for 45 volts and 13 amps.

The Electronic Load's front panel should indicate approximately 45 volts and between 7.2 to 10.9 amps. The front panel Prot annunciator should also be on.

e. Press [Meter] to display "––OP", indicating that an overpower condition exists and the Electronic Load is in power limit.

f. Let the Electronic Load continue running. Within three minutes the Electronic Load should turn its input off, and the display should show "PS – OP" indicating protection shutdown. IF THE OVERPOWER CIRCUIT DOES NOT TURN THE LOAD OFF WITHIN THREE MINUTES, STOP THE TESTS AND TROUBLESHOOT THE OVERPOWER CIRCUITS.

g. Immediately press [Prot Clear]. The "PS" display should blink and the input will remain shut down, indicating that protection shutdown is latched.

h. Wait approximately one minute and press [Prot Clear] again. This time the load should turn on with only "OP" displayed.

i. Reduce the power source output to 35 volts. The display should change to "–––" indicating that the protection shutdown and overpower conditions are cleared.

PERFORMANCE TEST RECORD - Agilent 60503B LOAD MODULE (Page 1 of 2)

Test Facility:
____
____
____
____

Report No.____________________________________
Date____
Customer_____________________________________
Tested by_____________________________________

Model **Agilent 60503B**
Serial No.____
Options____
Firmware Rev.____________________________________

Ambient temperature ___________________________°C
Relative humidity______________________________%
Line frequency_______________________Hz (nominal)

Special Notes:

____
____
____

Test Equipment Used

Description	**Model No.**	**Trace No.**	**Cal. Due Date**
1. AC Source	____________	____________	____________
2. DC Voltmeter	Agilent 3458A	____________	____________
3. Oscilloscope	Agilent 54504A	____________	____________
4. Power Source	Agilent 6035A	____________	____________
5. Power Source	Agilent 6032A	____________	____________
6. Current Probe	____________	____________	____________
7. Current Shunt	Guildline 9230/15	____________	____________
____________	____________	____________	____________
____________	____________	____________	____________
____________	____________	____________	____________

PERFORMANCE TEST RECORD - Agilent 60503B LOAD MODULE (Page 2 of 2)

Model **Agilent 60503B** Report No.____________________ Date______________________________

Test Description	Minimum Specification	Results	Maximum Specification	Measurement Uncertainty
		CONSTANT CURRENT MODE TESTS		
10 Ampere Range Programming and Readback				
High Current (l0A)	9.975	____________A	10.025	4 mA
Front Panel Display	A_{OUT} -0.022	____________A	A_{OUT} +0.022	4 mA
Low Current (1A)	0.9885	____________A	1.0115	427µA
Front Panel Display	A_{OUT} -0.011	____________A	A_{OUT} +0.011	427µA
1 Ampere Range Programming and Readback				
High Current (1A)	0.9885	____________A	1.0115	427µA
Front Panel Display	A_{OUT} -0.011	____________A	A_{OUT} +0.011	427µA
Low Current (0.1A)	0.0899	____________A	1.101	56µA
Front Panel Display	A_{OUT} -0.010	____________A	A_{OUT} +0.010	56µA
		CONSTANT VOLTAGE MODE TESTS		
Voltage Programming and Readback				
High Voltage (240V)	239.59	____________V	240.408	3mV
Front Panel Display	V_{OUT} -0.390	____________V	V_{OUT} +0..390	3mV
Low Voltage (3V)	2.876	____________V	3.1236	35µV
Front Panel Display	V_{OUT} -0.153	____________V	V_{OUT} +0.153	35µV
		CONSTANT RESISTANCE MODE TESTS		
Low Resistance Range				
Resistance (24 Ω)	23.6	____________Ω	24.4	
Resistance (1Ω)	0.792	____________Ω	1.208	
Middle Resistance Range				
Resistance (500Ω)	433	____________Ω	590	
Resistance (24 Ω)	23.75	____________Ω	24.25	
High Resistance Range				
Resistance (2000Ω)	1247	____________Ω	5037	
Resistance (240Ω)	223.3	____________Ω	259.5	
		TRANSIENT SLEW TEST		
Fast Slew Transient				
Slew Rate 0.083 A/µs	75	____________µs	125	
Slew Rate 0.0042 A/µs	1.5	____________ms	2.5	
		CONSTANT CURRENT PARD TEST		
Current (10A)	0	__________mA	1mA RMS	

3

Replaceable Parts

Introduction

Tables 3-3 and 3-4 list the electrical components and Table 3-5 lists the mechanical components for the Agilent 60503B Electronic Load Modules. These tables provide the following information.

- Reference designation (see Table 3-1).
- Agilent part number.
- Description of part (see Table 3-2).

Refer to Figures 4-2 and 4-4 for component locations.

Table 3-1. Reference Designators

A	Assembly	RTB	Removable Terminal Block
B	Blower	RTP	Removable Jumper
C	Capacitor	S	Switch
D	Diode	T	Transformer
F	Fuse	TB	Terminal Block
J	Terminal Jack	TBP	Test Pin
MP	Mechanical Part	U	Integrated Circuit
P	Terminal P1ug	VR	Voltage Regulator
Q	Transistor	W	Cable Assembly
RT	Thermal Resistor	Y	Oscillator

How To Order Parts

You can order parts from your local Agilent Technologies sales office (refer to the list at the end of this manual for the office nearest you). When ordering parts, include the following information:

- Agilent part number
- Description of the part
- Quantity desired
- Electronic Load model number (Agilent 60503B)

Table 3-2. Part Description Abbreviations

AL	Aluminum	PE	Polyester
CC	Carbon Composition	PD	Power Dissipation
CER	Ceramic	PP	Polypropylene
DIP	Dual In-Line Package	PWR	Power
DPDT	Double Pole Double Throw	RECT	Rectifier
FF	Flip Flop	SIP	Single In-Line Package
FXD	Fixed	TA	Tantalum
GEN-PURP	General Purpose	TC	Temperature Coefficient
IC	Integrated Circuit	TF	Thin Film
MACH	Machine	W/	With
MO	Meta1 Oxide		

Table 3-3. Agilent 60503B Control Board - Electrical Parts

Reference Designation	Agilent Part Number	Description
	60503-60027	**CONTROL BOARD**
C301	0180-0405	CAPACITOR-FXD 1.8µF ±10% 20Vdc TA
C302	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C303,304	0160-4807	CAPACITOR-FXD 33pF ±5% 100Vdc CER 0±30
C306,307	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C311	0160-6579	CAPACITOR-FXD 2200pF ±2.5% 100Vdc PP
C312	0160-5349	CAPACITOR-FXD 200pF ±5% 100Vdc CER 0±30
C314-317	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C323-327	0160-5422	CAPACITOR-FXD .047uF ±20% 50Vdc CER
C329	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C330	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0 ±30
C331-337	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C339	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0 ±30
C340,341	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C342	0160-4822	CAPACITOR-FXD 1000pF ±5% 100Vdc CER 0±30
C343	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C344	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C345	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C346,347	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C348	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0±30
C349,350	0180-4112	CAPACITOR-FXD 1700µF+30-10% 50Vdc AL
C351	0180-4131	CAPACITOR-FXD 4.7µF ±10% 35Vdc TA
C352	0180-3804	CAPACITOR-FXD 47µF ±20% 35Vdc TA
C353	0180-4131	CAPACITOR-FXD 4.7µF ±10% 35Vdc TA
C357,359	0160-4800	CAPACITOR-FXD 120pF ±5% 100Vdc CER 0 ±30
C363	0160-4820	CAPACITOR-FXD 1800pF ±5% 100Vdc CER 0±30
C365	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C366,367	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C371	0160-4831	CAPACITOR-FXD 4700pF ±10% 100Vdc CER
C372	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0±30
C373	0180-0376	CAPACITOR-FXD .47µF ±10% 35Vdc TA
C374	0160-4791	CAPACITOR-FXD 10pF ±5% 100Vdc CER 0 ±30
C375	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C376	0160-4835	CAPACITOR-FXD .lµF ±10% 50Vdc CER
C377,378	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C379	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C380,381	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C382	0160-4829	CAPACITOR-FXD 680pF ±10% 100Vdc CER
C383	0160-4820	CAPACITOR-FXD 1800pF ±5% 100Vdc CER
C384	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C385	0180-0405	CAPACITOR-FXD 1.8µF ±10% 20Vdc TA
C387-389	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C391	0160-8153	CAPACITOR-FXD 4700pF 250Vdc

Table 3-3. Agilent 60503B Control Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
D302-304	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D306,308	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D310-313	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D314-317	1901-0731	DIODE-PWR RECT 400V lA
D321	1901-0880	DIODE-GEN PURP 200mA DO-35
F300	2110-0716	FUSE-SUBMINIATURE .5A 125V
F301,302	2110-0821	FUSE (METRIC) .315A 250V
J1-3	1252-2789	CONNECTOR-POST RT ANGLE 12-CONTACT
Pl-3	60502-80005	CABLE ASSEMBLY W/PLUG 12-CONTACT
P4	60502-80007	CABLE ASSEMBLY W/PLUG 26-CONTACT
Q301	1858-0054	TRANSISTOR ARRAY 16-PIN DIP
R305	0698-4443	RESISTOR 4.53K 1% .125W TF TC=0±100
R306	0698-6320	RESISTOR 5K .1% .125W TF TC=0±25
R307	0698-0085	RESISTOR 2.61K 1% .125W TF TC=0±100
R308	0757-0462	RESISTOR 75K 1% .125W TF TC=0±100
R309	0698-6320	RESISTOR 5K .1% .125W TF TC=0±25
R310,311	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R314	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R315	0698-0085	RESISTOR 2.61K 1% .125W TF TC=0±100
R316	0699-0924	RESISTOR 11K .1% .125W TF TC=0±25
R317,318	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R319,320	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R321,322	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0+100
R323,324	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R325-327	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R329	0757-0416	RESISTOR 511 1% .125W TF TC=0±100
R330,331	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R332	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R333	1810-0368	RESISTOR-NET 6-PIN SIP 10.0K X 5
R337	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R338	0699-0924	RESISTOR 11K .1% .125W TF TC=0±25
R339,340	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R341	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R342	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R343	0698-4443	RESISTOR 4.53K 1% .125W TF TC=0±100
R344	0757-0439	RESISTOR 6.81K 1% .125W TF TC=0±100
R345	0699-0924	RESISTOR 11K .1% .125W TF TC=0±25
R346	0698-6533	RESISTOR 12.5K .1% .125W TF TC=0±25
R347	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R348	0698-3215	RESISTOR 499K 1% .125W TF TC=0±100
R354	0699-1797	RESISTOR 10M 5%
R355	1810-0280	RESISTOR-NET 10-PIN SIP 10.0K X 9
R356,357	0698-3633	RESISTOR 390 5% 2W MO TC=0±200
R358	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100

Table 3-3. Agilent 60503B Control Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
R359-361	0757-0424	RESISTOR l.1K 1% .125W TF TC=0±100
R365	0757-0441	RESISTOR 8.25K 1% .125W TF TC=0±100
R368,369	0699-1728	RESISTOR 2.652K .1% .125W TF TC=0±25
R370,371	0698-8672	RESISTOR 243.4 .1% .125W TF TC=0±25
R372	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R375	0757-0280	RESISTOR lK 1% .125W TF TC=0±100
R379	0698-0084	RESISTOR 2.15K 1% .125W TF TC=0±100
R380	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R381	0698-4503	RESISTOR 66.5K 1% .125W TF TC=0±l00
R382	0698-4486	RESISTOR 24.9K 1% .125W TF TC=0±100
R383	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R384	0698-3215	RESISTOR 499K 1% .125W TF TC=0±100
R385	0698-3379	RESISTOR 4.99K 1% .125W TF TC=0±100
R386	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R387,388	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R389	0757-0436	RESISTOR 4.32K 1% .125W TF TC=0±100
R390	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R391	0757-0437	RESISTOR 4.75K 1% .125W TF TC=0±100
R392	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R393	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R394	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R395	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R396	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R397	0698-0084	RESISTOR 2.15K 1% .125W TF TC=0±100
R398	0757-0420	RESISTOR 750 1% .125W TF TC=0±100
R399	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
R400	0757-0455	RESISTOR 36.5K 1% .125W TF TC=0±100
R401	0757-0278	RESISTOR 1.78K 1% .125W TF TC=0±100
R406	0764-0041	RESISTOR 30 5% 2W MO TC=0±200
R413,414	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R415	0757-0455	RESISTOR 36.5K 1% .125W TF TC=0±100
R416	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R417	0757-0401	RESISTOR 100 1% .125W TF TC=0±100
R418	0698-3430	RESISTOR 21.5 1% .125W TF TC=0±100
R420	1810-0280	RESISTOR-NET 10-PIN SIP 10.0K X 9
R421,422	8159-0005	RESISTOR-ZERO OHMS 22 AWG
R423	0757-0401	RESISTOR 100 1% .125W TF TC=0±100
RTBl	0360-2345	MATING PLUG FOR TB301 (control)
RTP301	1258-0209	REMOVABLE JUMPER 2-POSITION
T301	9100-4840	TRANSFORMER-PWR 100/120/220/240V
TB301	0360-2348	TERMINAL BLOCK 10-TERMINAL
TP301	1251-4926	CONNECTOR-POST TYPE 8-CONTACT
U301	5080-2516	IC PROGRAMMABLE MICROPROCESSOR
U302	1820-3399	IC FF CMOS/74HC D-TYPE POS EDGE-TRIG

Table 3-3. Agilent 60503B Control Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
U303	1820-2228	IC QUAD NAND SET/RESET LATCH CMOS
U304	1820-3079	IC 3-TO-8 LINE DECODER CMOS/74HC
U306	1826-1845	IC DUAL OP AMP 8-PIN DIP (PRECISION)
U307	1826-1317	IC DUAL OP AMP 8-PIN DIP (LOW NOISE)
U308	1826-0962	IC DUAL OP AMP 8-PIN DIP
U309	1826-0850	ANALOG SWITCH 16-PIN DIP
U318	1820-2924	IC QUAD NOR GATE CMOS/74HC 2-INPUT
U319	1820-3399	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U320	1826-1488	D/A CONVERTER CMOS 12-BIT 20-PIN
U321	1826-1068	D/A CONVERTER CMOS 8-BIT 20-PIN
U322	1826-1488	D/A CONVERTER CMOS 12-BIT 20-PIN
U323	1826-0962	IC DUAL OP AMP 8-PIN DIP
U324	1826-1845	IC DUAL PRECISION OP AMP 8-PIN DIP
U325	1826-0962	IC DUAL OP AMP 8-PIN DIP
U326	1826-1081	IC PRECISION OP AMP 8-PIN DIP
U327	1826-1370	IC QUAD COMPARATOR 16-PIN DIP
U328	1826-1081	IC PRECISION OP AMP 8-PIN DIP
U329	1826-1369	IC REGULATOR-FXD 9.95/10.05V 8-PIN DIP
U330	1820-3399	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U332-334	1990-0996	IC LED OPTO-ISOLATOR IF=10mA MAX
U335	1826-0393	IC REGULATOR-ADJUSTABLE 1.2/37V POS
U336	1826-0122	IC REGULATOR-FXD 4.8/5.2V
U337	1826-0527	IC REGULATOR-ADJUSTABLE 1.2/37V NEG
U340	1826-0850	ANALOG SWITCH 16-PIN DIP
U341	1820-3297	IC OCTAL BUS DRIVER CMOS/74HC
U342	1818-4932	IC EEPROM NMOS 1024 (lK)
U344	1826-0962	IC DUAL OP AMP 8-PIN DIP
U345	1820-3399	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U346	1826-0850	ANALOG SWITCH 16-PIN DIP
U347	1826-0412	IC DUAL PRECISION COMPARATOR 8-PIN DIP
U348	1826-1343	IC REGULATOR-ADJUSTABLE 2.5/36V 8-PIN DIP
U349	5080-2137	IC PROGRAMMED GAL
U350	1820-6774	IC BIN COUNTER CMOS/74HC POS-EDGE-TRIG
U351	5080-2121	IC DECADE DIVIDER GATE ARRAY
U352	1820-3172	IC FF CMOS/74HC J-K POS-EDGE-TRIG
U353	1820-3081	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U354,355	1820-3082	IC TRANSCEIVER OCTAL BUS
VR301,302	1902-0957	DIODE-ZENER 9.1V 5% PD=.4W
VR303,304	1902-0783	DIODE-ZENER 16.2V 5% PD=1W
W1	7175-0057	RESISTOR-ZERO OHMS SOLID TINNED COPPER
Y301	0410-1944	RESONATOR-QUARTZ 4.0000MHz

Table 3-4. Agilent 60503B Power Board - Electrical Parts

Reference Designation	Agilent Part Number	Description
	60503-60024	**POWER BOARD**
Cl-8	0160-4820	CAPACITOR-FXD 1800pF ±5% 100Vdc CER
C11-21	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C25	0160-7369	CAPACITOR-FXD lµF ±10% 400Vac CER
C26	0160-4831	CAPACITOR-FXD 4700pF ±10% 100Vdc CER
C32,33	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C34	0160-4048	CAPACITOR-FXD .022µF ±20% 250Vac
C35	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C36	0160-5469	CAPACITOR-FXD 1µF ±10% 50Vdc METAL-PE
C38-42	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C49-56	0160-4810	CAPACITOR-FXD 330pF ±5% 100Vdc CER
C60	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C106	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C125	0160-5166	CAPACITOR-FXD .015µF ±20% 100Vdc CER
C126	0160-5098	CAPACITOR-FXD .22µF ±10% 50Vdc CER
C127	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C128	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C129	0160-2569	CAPACITOR-FXD .02µF ±20% 2KV CER
C130	0150-0052	CAPACITOR-FXD 0.05µF ±20% 400Vac CER
C131	0160-4834	CAPACITOR-FXD .047µF ±10% 100Vdc CER
C132,133	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C134	0160-4801	CAPACITOR-FXD 100pF ±5% 100Vdc CER 0±30
C135	0160-4830	CAPACITOR-FXD 2200pF ±10% 100Vdc CER
C136	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C137	0160-4832	CAPACITOR-FXD .01µF ±10% 100Vdc CER
C138	0160-4814	CAPACITOR-FXD 150pF ±5% 100Vdc CER 0±30
C139	0160-4832	CAPACITOR-FXD .01µF ±10% 100Vdc CER
C140	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C142	0160-4918	CAPACITOR-FXD .022µF ±10% 50Vdc CER
C143	0160-4812	CAPACITOR-FXD 220pF ±5% 100Vdc CER 0±30
C144-151	0160-4807	CAPACITOR-FXD 33pF ±5% 100Vdc CER
C152	0160-4831	CAPACITOR-FXD 4700pF ±10% 100Vdc CER
C153	0160-2496	CAPACITOR-FXD 470pF ±10% 1KV CER
C154	0160-4832	CAPACITOR-FXD .01µF ±10% 100Vdc CER
C155	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C156	0160-4821	CAPACITOR-FXD 1200pF ±5% 100Vdc CER
C157	0160-4183	CAPACITOR-FXD 1000pF ±20% 250Vdc CER
D10,11	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D17-28	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D33	1901-0880	DIODE-GEN PURP 200mA DO-35
D35	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D53-55	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D56	1901-0731	DIODE-PWR RECT 400V lA
D57,58	1901-0880	DIODE-GEN PURP 200mA DO-35
D59		NOT USED
D60	1901-0033	DIODE-GEN PURP 180V 200mA lN645

Table 3-4. Agilent 60503B Power Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
D62	1901-0880	DIODE-GEN PURP 200mA DO-35
D63		NOT USED
Fl-8	2110-0757	FUSE-SUBMINIATURE .062A 125V
F9-16	2110-0685	FUSE-SUBMINIATURE 7A 125V
J2	1251-4670	CONNECTOR-POST RT ANGLE 9-CONTACT
J4	1251-7743	CONNECTOR-POST 26-CONTACT
Ll-32	9170-1499	CORE TOROID
Ql,2	1855-0819	FET SUBASSEMBLY (includes 4 FETS)
Q9	1855-0386	TRANSISTOR J-FET 2N4392 N-CHANNEL
Q10	1854-0635	TRANSISTOR NPN SI PD=50W FT=20MHz
Q11	1853-0281	TRANSISTOR PNP SI 2N2907A PD=400mW
Q12	1858-0054	TRANSISTOR ARRAY 16-PIN DIP
Rl-8	0811-3845	RESISTOR .3 1% 3W
R9-16	0698-3430	RESISTOR 21.5 1% .125W TF TC=0±100
R17-24	0698-3156	RESISTOR 14.7K 1% .125W TF TC=0±100
R25,26	0698-3162	RESISTOR 46.4K 1% .125W TF TC=7±100
R27	0757-0457	RESISTOR 47.5K 1% .125W TF TC=0±100
R28	0698-3162	RESISTOR 46.4K 1% .125W TF TC=7±100
R29-32	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
R33-40	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R41	1810-1260	RESISTOR-NET 10-PIN SIP 20K X 9
R43	1810-0316	RESISTOR-NET 16-PIN DIP 10.0k X 8
R44	0698-0085	RESISTOR 2.61K 1% .125W TF TC=0±100
R46	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R50	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
R53	0698-6620	RESISTOR 150K .1% .125W TF TC=0±25
R54	0698-6332	RESISTOR 300K .1% .125W TF TC=0±25
R55,56	0698-6533	RESISTOR 12.5K .1% .125W TF TC=0±25
R58	0698-3160	RESISTOR 31.6K 1% .125W TF TC=0±100
R59	0698-4496	RESISTOR 45.3K 1% .125W TF TC=0±100
R60	0698-4457	RESISTOR 576 1% .125W TF TC=0±100
R64	0757-0455	RESISTOR 36.5k 1% .125W TF TC=0±100
R65	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R66	0698-0084	RESISTOR 2.15K 1% .125W TF TC=0±100
R67	0757-0427	RESISTOR 1.5K 1% .125W TF TC=0±100
R68	0698-6630	RESISTOR 20K .1% .125W TF TC=0±25
R69	0699-0620	RESISTOR 2.222K .1% .125W TF TC=0±25
R71	0699-0486	RESISTOR 2K .1% .125W TF TC=0±25
R88	0811-1760	RESISTOR 4.3 5% 2W PWR TC=0±400
R90	0698-6533	RESISTOR 12.5K .1% .125W TF TC=0±25
R91	0698-3456	RESISTOR 287K 1% .125W TF TC=0±100
R92,93	0698-3153	RESISTOR 3.83K 1% .125W TF TC=0±100
R94	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R95	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R96	0698-6620	RESISTOR 150K .1% .125W TF TC=0±25
R101-104	1810-1261	RESISTOR-NET 16-PIN DIP MULTI-VALUE

Table 3-4. Agilent 60503B Power Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
R105	0698-6320	RESISTOR 5K .1% .125W TF TC=0±25
R106	0698-3572	RESISTOR 60.4K 1% .125W TF TC=0±100
R107,108	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R109	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R110	0698-3160	RESISTOR 31.6K 1% .125W TF TC=0±100
R1 14	0757-0447	RESISTOR 16.2K 1% .125W TF TC=0±100
R115	0757-0416	RESISTOR 511 1% .125W TF TC=0±100
R116	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R117	0698-6320	RESISTOR 5K .1% .125W TF TC=0±25
R136	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R142	1810-1274	RESISTOR-NET 10-PIN SIP MULTI-VALUE
R143	0757-0427	RESISTOR 1.5K 1% .125W TF TC=0±100
R144	0698-4479	RESISTOR 14K 1% .125W TF TC=0±100
R151	0698-3160	RESISTOR 31.6K 1% .125W TF TC=0±100
R201	0757-0441	RESISTOR 8.25K 1% .125W TF TC=0±100
R202	0757-0317	RESISTOR 1.33K 1% .125W TF TC=0±100
R204	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R205	0757-0429	RESISTOR 1.82K 1% .125W TF TC=0±100
R206	0757-0401	RESISTOR 100 1% .125W TF TC=0±100
R207	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R208	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R209	0683-0475	RESISTOR 4.7 5% .25W CF TC=0-400
R211	0757-0278	RESISTOR 1.78K 1% .125W TF TC=0±100
R212	0757-0439	RESISTOR 6.81K 1% .125W TF TC=0±100
R213	0698-4496	RESISTOR 45.3K .1% .125W TF TC=0±25
R214	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
R215	0757-0270	RESISTOR 249K 1% .125W TF TC=0±100
R216	0757-0278	RESISTOR 1.78K 1% .125W TF TC=0±100
R217-224	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R225	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R226	2100-3750	RESISTOR-TRIMMER 20K 10%
R228	0811-1760	RESISTOR 4.3 5% 2W PWR TC=0±400
R229,230	0683-0475	RESISTOR 4.7 5% .25W CF TC=0-400
R231	0683-1065	RESISTOR 10M 5% .25W CC TC=-900/+1100
R233	1810-0368	RESISTOR-NET 6-PIN SIP 10K X 5
R234	0757-0279	RESISTOR 3.16K 1% . 125W TF TC=0±100
R235	0757-0439	RESISTOR 6.81K 1% .125W TF TC=0±100
R238	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R239	0757-0405	RESISTOR 162 1% .125W TF TC=0±100
R249	0698-6620	RESISTOR 150K .1% .125W TF TC=0±25
R252	0698-6620	RESISTOR 150K .1% .125W TF TC=0±25
R255,256	0757-0463	RESISTOR 82.5K 1% .125W TF TC=0±100
R257	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R259,261	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R262	0698-3226	RESISTOR 6.49K 1% .125W TF TC=0±100
R263	0757-0444	RESISTOR 12.1K 1% .125W TF TC=0±100

Table 3-4. Agilent 60503B Power Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
R264-266	8159-0005	RESISTOR-ZERO OHMS 22 AWG
R267	1810-1490	RESISTOR-NET 12-PIN DIP MULTI-VALUE
R268	1810-1489	RESISTOR-NET 8-PIN SIP MULTI-VALUE
R269	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R270	0757-0436	RESISTOR 4.32K 1% .125W TF TC=0±100
R271	0757-0443	RESISTOR 11K 1% .125W TF TC=0±100
R272	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R274	0757-0274	RESISTOR 1.21K 1% .125W TF TC=0±100
R275-282	0698-8827	RESISTOR lM 1% .125W TF TC=0±100
R283	0698-8913	RESISTOR 1.5M 1% .125W TF TC=0±100
R284	0698-0064	RESISTOR 9.31K 1% .125W TF TC=0±100
R285	0757-0464	RESISTOR 90.9K 1% .125W TF TC=0±100
R288	0698-8913	RESISTOR 1.5M 1% .125W TF TC=0±100
R289	0698-4536	RESISTOR 340K 1% .125W TF TC=0±100
R290	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
RT2	0837-0412	THERMISTOR 10K (under large heatsink)
S1	3101-2894	SENSE SWITCH DPDT
	0370-2862	PUSHBUTTON (for sense switch)
U1	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U2,3	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U4	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U5	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U6	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U7	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U8	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U9	1826-0850	IC ANALOG SWITCH 16-PIN DIP
U10	1826-0138	IC QUAD COMPARATOR 14-PIN DIP
U11	1826-1370	IC QUAD COMPARATOR 16-PIN DIP
U12	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U13	1826-0962	IC DUAL OP AMP 8-PIN DIP LOW BIAS H-IMPD
U14	1826-1543	IC DUAL OP AMP 8-PIN DIP HS
U15	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U16	1826-0962	IC DUAL OP AMP 8-PIN DIP LOW BIAS H-IMPD
U17	1826-0346	IC DUAL OP AMP 8-PIN DIP GP
VR10	1902-0783	ZENER DIODE 16V 5% PD=1W
VR26	1902-3149	ZENER DIODE 9.09V 5% PD=.4W
VR27	1902-0761	ZENER DIODE 1N821 6.2V 5% PD=.4W
VR28	0387-0277	VOLTAGE SUPPRESSOR 256V (BV=285V MIN)
VR29		NOT USED

Table 3-5. Agilent 60503B Mechanical Parts

Agilent Part Number	Quantity	Description
		CONTROL BOARD
60502-00001	1	MODULE CHASSIS
7121-0850	1	WARNING LABEL
7121-2794	1	SERIAL# LABEL
0515-0413	2	SCREW-MACH M5X0.8X6mm (rear panel to module chassis)
0515-0414	6	SCREW-MACH M4X0.7X10mm (control board to module chassis)
60502-80004	2	SPACER-PLASTIC (align heatsink with module chassis)
1205-0730	2	HEATSINK (U335,337)
0515-0104	2	SCREW-MACH M3X0.5 (U335,337)
0535-0031	2	NUT-HEX W/LOCKWASHER M3 (U335,337)
3050-0891	2	WASHER M3 (U335,337)
2110-0689	4	FUSE CLIP (F301,302)
		POWER BOARD
60502-20001	1	LARGE HEATSINK (for Q1, Q2)
1205-0743	2	THERMAL PAD (between Q1, Q2 and heatsink)
0340-1217	1	INSULATOR (in heatsink for RT2)
60502-00002	1	REAR PANEL
60503-80002	1	REAR PANEL LABEL
1510-0134	2	BINDING POST ASSEMBLY
3050-1320	2	SPRING STEEL WASHER (on binding post)
2190-0629	2	LOCKWASHER (on binding post)
0535-0020	2	NUT-HEX (on binding post)
0515-0155	2	SCREW-MACH M5X0.8X12mm (binding post to bus bar)
0515-1146	1	SCREW-MACH M3X0.5X6mm (ground wire to chassis)
3050-0891	1	WASHER M3 (ground to chassis)
60502-00003	1	BUS BAR (- input)
60502-00004	1	BUS BAR (+ input)
0515-1584	2	SCREW MACH M5X0.8X8mm (bus bar to power board)
0515-0414	14	SCREW-MACH M4X0.7X10mm (power board to chassis and large heatsink; Q1, Q2 to large heatsink; and bus bar to large heatsink)
4040-2268	1	SAFETY COVER (rear panel terminal block)
		MISCELLANEOUS
9222-1375	1	BAG, STATIC PROTECTION
60502-80002	1	FLOATER, ANTI-STATIC
60502-80003	1	FLOATER, ANTI-STATIC
9211-6196	1	CARTON, SHIPPING
60503-90007	1	MANUAL, OPERATING
60503-90009	1	MANUAL, SERVICE

4

Diagrams

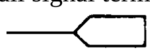
Schematic Diagrams

Schematic diagrams and component location diagrams are provided for the Control board as well as the Power board on two foldout pages. Two schematic diagrams of the Power board are included in Figure 4-2 on the first foldout; three schematic diagrams of the Control board are included in Figure 4-4 on the second foldout. Table 4-1 lists the notes that apply to both the Control board and Power board schematic diagrams.

Table 4-2 lists, alphabetically, all of the signal names that appear on the schematic, along with a brief description of the signal's function. To help you locate where signals come from and go to, Table 4-1 lists the coordinates for each appearance of a signal on each sheet of the schematic. Coordinates printed in **BOLD** indicate the signal origin. On the Control board for example, when ACLR* is active, it clears the analog circuits. ACLR* originates in area 4D of sheet 1 and also appears in area 2B of sheet 3.

Table 4-1. Schematic Diagram Notes

1. All resistors are in ohms ± 1%, 1/8 W unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All unmarked capacitors are 0.047µF.
4. An asterisk negates a signal name. For example, $\overline{CS2}$ appears on the schematic as CS2*.
5. Signal lines that are terminated by flags continue on other sheets, and may also go to other locations on the same sheet. Table 4-2 documents all signal terminations on the schematics. Note that flags do not indicate signal flow direction.

Example:  CC_PROG

6. Unterminated signal lines go to at least one other location of the same schematic sheet.

Example: SPCLR*

7. Heavy signal lines represent multiple-wire data buses.
8. Unless otherwise noted, bias connections to IC packages are as follows:

	Common	**+5V**
14-pin packages	pin 7	pin 14
16-pin packages	pin 8	pin 16
20-pin packages	pin 10	pin 20

9. Values in brackets [ ] apply to model 60507B.

Component Location Diagrams

Each foldout includes a component locations diagram with a look-up table for locating electrical components. Figure 4-1 gives the component locations for the Control board and Figure 4-3 gives the component locations for the Power board. The coordinates in the look-up table under each diagram reference the grid on the diagram and give the location of some point on each component to within 1/10 of a unit. The mainframe Service Manual gives several examples of how to use the table.

The component locations diagram also indicates specific troubleshooting test point locations. The test points are described in Chapter 3 of the mainframe Service Manual and are used in various troubleshooting procedures described in that chapter.

Table 4-2. Signal-Name Descriptions

Mnemonic	Function	Sheet 1	Sheet 2	Sheet 3
	CONTROL BOARD			
ACLR*	Analog circuits clear (D)	**4D**		2B
BO*	Brown out input disable (D)	3D		2A
CC_EN*	CC mode enable (D)	**6D**, 3B		
CC_PROG	Programming voltage for CC mode (A)	**3B**	2B	
CCVTST	Comparator output, main DAC self-test (D)	6D	**4A**	
CG*	CR-mode middle-and-high-range select (D)	**5D**	4D	
CLR	Initialize transient generator (D)	**7B**, 5A		
CR*	CR-mode low-range select (D)	**5D**	3C	2A
CS0*	Main DAC chip select (D)	**1D,**	8D	
CS1*	Transient DAC chip select (D)	**1D**	7C	
CS2*	Slew range chip select (D)	**1D**, 8C		
CS3*	Readback DAC chip select (D)	**1D**	8B	
CS4*	Secondary-data-bus buffer chip select (D)	**1D**	8D	
CS5*	Control-signals latch chip select (D)	**1D**, 6D		
CS6*	Control-signals latch chip select (D)	**7D**, 5D		
CS7*	Non-volatile memory R/W chip select (D)	**8D** 3C, 2C		
CV_EN*	CV mode enable (D)	**6D**, 3C		
CV_PROG	Programming voltage for CV mode (A)	**3C**		2C
DAC_REF*	Main DAC reference enable, CV/CC modes (D)	**5D**	3D	
E	Secondary-µP clock (D)	6D, 8A		
EEPON*	EEPROM power-on disable (D)	2C		**2D**
EPC_EN*	Extended power capability enable/disable (D)	**4D**		2A
EXT_PROG	Ext programming input (A) from rear-panel A4			**1B**, 3C
FLT	Voltage-fault signal (D) to rear-panel A6	**3D**	1B	
FSEL0,FSEL1,FSEL2	Transient-generator frequency-select bits (D)	**5D**, 4A		
HIGH*	Transient-DAC output enable (D)	**6B**	8C	
H/L*	Main-DAC transfer control (D)	**7D**	8D	
H/L-A/D	Readback-DAC transfer control (D)	**7D**	8B	
IMON	Current-monitor output (A) to rear-panel A1		**1D,** 1C	
IMON*	Input-current monitor signal (A)		3D, 6A	2C
	CR-mode low-range DAC reference (A)		4C	
IMONR	Current-monitor-comparator output (D)	6D	**4A**	
LCLR*	Clear status latch (D)	**5D**, 3D		
MODULE_INSTALLED*	Indicate how many modules are installed (D)			**8B**
OP*	Overpower status (D)	3D		2A
OV*	Overvoltage status (D)	3D		2A
PCLR1*	Power-on clear signal from mainframe (D)			**8B**
PORT	PORT output (D) to rear-panel A7	**3D**	1B	
PRX	Primary-µP receiver (D)			8A
PTX	Primary-µP transmitter (D)			8A
P_TRIG	Continuous mode pulse trigger (D)	6A, 5D		
PRI_TRIG	Trigger signal from mainframe (D)			**8B**
PULSE_EN	Pulse-mode enable (D)	**4D**, 6B		
RCK_HI*	Loads transient-level counter (D)	**1D**, 6A		
RCK_LOW*	Loads main-level counter (D)	**1D**, 6A		
RNG	CC-mode range select (D)	**7C**		2B

(A) = analog signal (D) = digital signal 8C = signal origin

Table 4-2. Signal-Name Descriptions

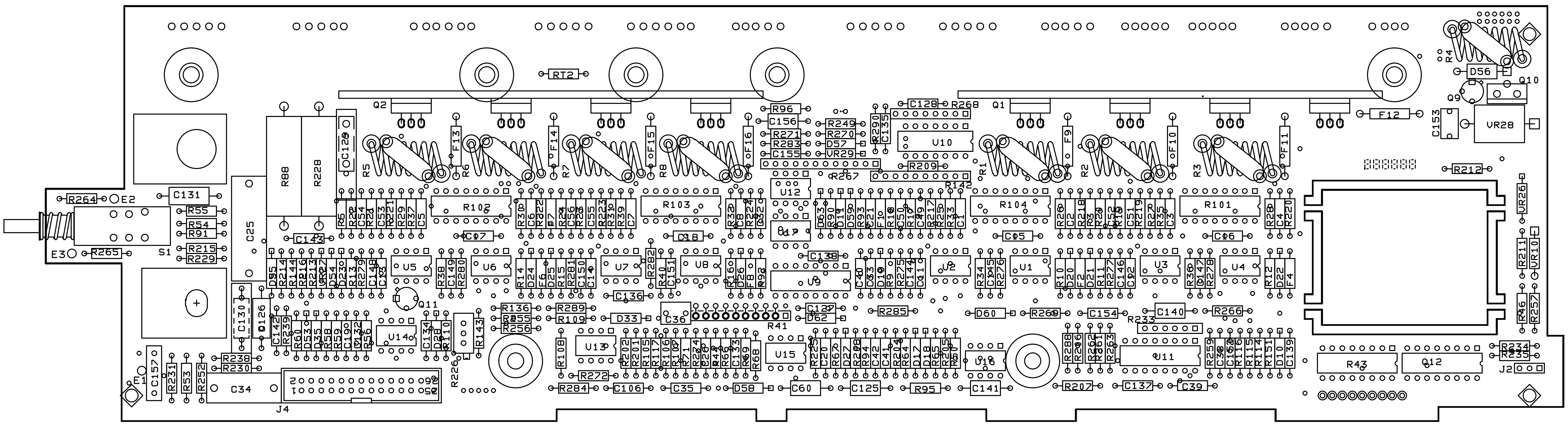
Mnemonic	Function	Sheet 1	Sheet 2	Sheet 3
	CONTROL BOARD			
+ S	Remote + sense (A) from rear-panel + S		**1C**	2C
- S	Remote - sense (A) from rear-panel - S		**1C**	2C
SA_EN*	Secondary µP SA enable (D) from TP301-1	**1C,** 7D		
SD	Secondary µP data bus (D)			
SDB	Secondary µP data bus, buffered (D)			
SKP	Skip self-test (D) from TP301-5	**1B,** 6D		
SLEW	Programming-voltage input to slew circuit (A)	5B	**4C**, 5A	
SLW1,SLW2,SLW3,SLW4	Slew-rate control signals (D)	**8C**,8B, 8C,7C, 5C		
SPCLR*	Secondary-circuit power-on clear (D)	lB,7D,6D, 5D	8D	**2D**,2A
SPROG	(not used)		2D	2C
SRX	Secondary-µP receiver (D)	**8D**		**5B**
START	Secondary-µP SA start signal (D)	**1B**		
STAT_EN	Enable status latch (D)	**4D**, 3D		
STB*	Enable chip-select decoder (D)	**7C**, 2D		
STOP	Secondary-µP SA stop signal (D)	**1B**		
STX	Secondary-µP transmitter (D)	**8D**, 1B		5A
S0, S1, S2	Chip-select-decoder input (D)	**7C**, 2D		
TEMP1	Power-board temperature (A)		5A	2C
TMONR	Temperature-monitor-comparator output (D)	6D	4A	
TOGGLE*	Toggle mode select (D)	6B	4A	
TRANS_EN	Transient-generator clear and enable (D)	**4D**, 8B, 7B		
	Secondary-µP SA start/stop (D)	**4D**, 1B		
TRIG	Trigger (D)	6A	8C	**5B**
TRIG_EN*	Main and transient DACs trigger enable (D)	**4D**	8D	
UNREG*	Unregulated-input status (D)	3D		2A
UXFER	Main and transient DACs transfer control (D)	**7C**	8D	
VMON	Voltage-monitor output (A) to rear-panel A2		**1C**, 1C	
VMON*	Input-voltage monitor signal (A)		3C, 6A	2B
	CR-mode middle-&-high-range DAC Ref (A)		5D	
VMONR	Voltage-monitor-comparator output (D)	6D	**4A**	
VREF	Voltage reference for DACs (A)		**6D**, 8B, 5C	
X	(not used)	3D		2A
-10V_REF	DAC reference for CV and CC modes (A)		**2B**, 4D, 6A	
+15V	To power board (A)			**5D**, 2B
-15V	To power board (A)			**5C**, 2B
+ 12V_REF	Ref for readback DAC & main DAC self-test (A)		**1A**, 5B, 7B, **5D**, 2B	2B

(A) = analog signal (D) = digital signal 8C = signal origin

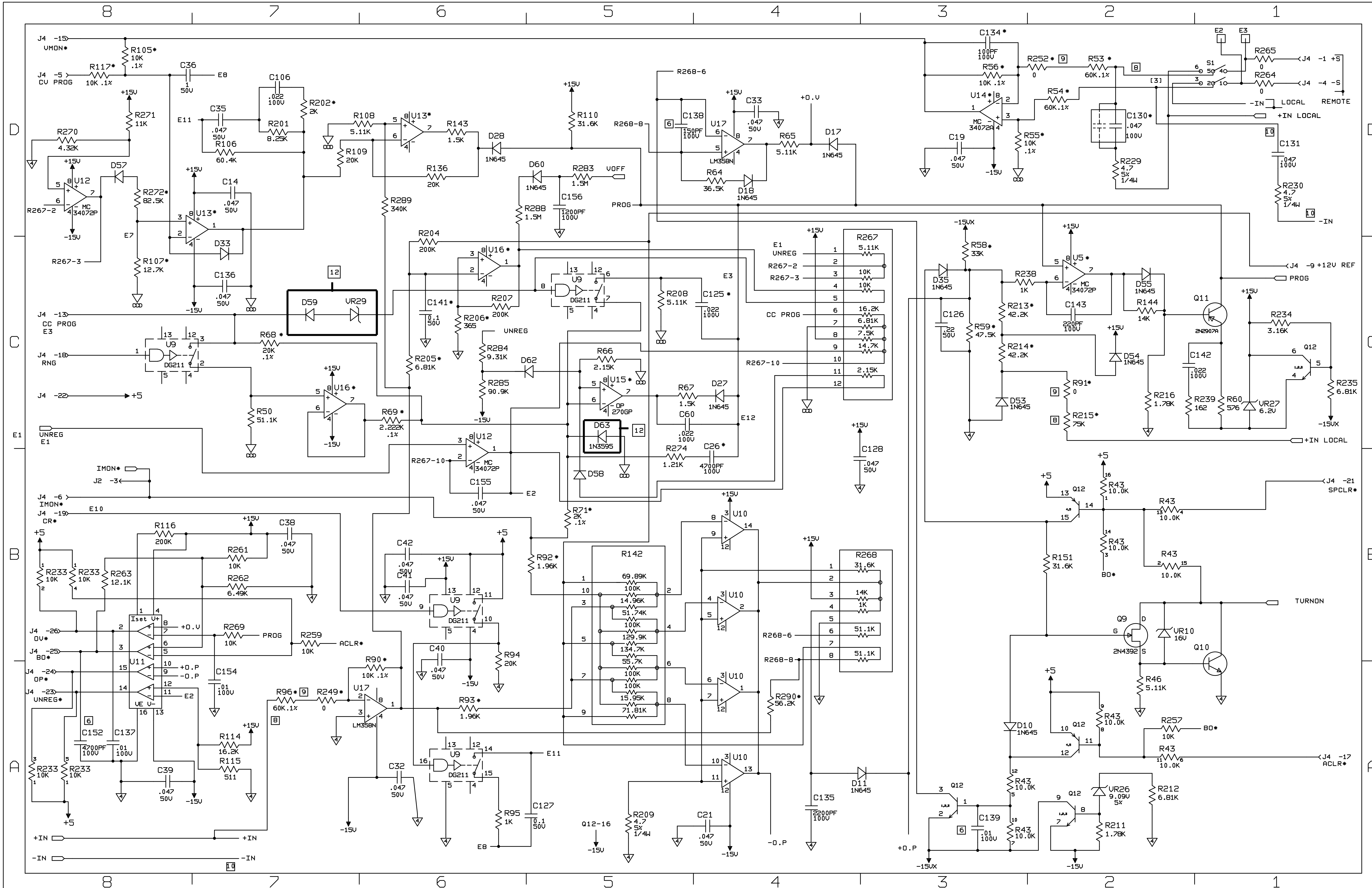
Table 4-2. Signal-Name Descriptions

Mnemonic	Function POWER BOARD	Sheet 1	Sheet 2	Sheet 3
ACLR*	Analog circuits clear (D)	1A, 7B		
BO*	Brown out input disable (D)	1A, 2B, 8B		
+BUS	+ input binding post		4A	
- BUS	- input binding post		4A	
CC_PROG	Programming voltage for CC mode (A)	8C, 4C		
CR*	CR mode low range select (D)	8B		
CV_PROG	Programming voltage for CV mode (A)	8D		
E2	Electrical connection	8A, 6B		
E8	Electrical connection	6A, 7D		
E11	Electrical connection	5A, 8D		
IMON*	Input-current monitor signal (A)	8B	7A	
+IN	+input (A)	8A,7A,6D,lD,lC	**4A**	
- IN	- input (A)	8A, 7A, 1D	**4A**	
+ IN Local	Same as + input (A)	1D	4A	
+ OP	Overpower comparator input (A) (low = OP)	**3A**, 8A		
- OP	Overpower comparator input (A) (high = OP)	**4A**, 8A		
OP*	Overpower status (D)	**8A**		
+OV	Overvoltage comparator input (A) (low = OV)	**4D**, 8B		
OV*	Overvoltage status (D)	**8B**		
PROG	Programming input to power circuits (A)	**5D**, 1C, 7B	8D	
	Overvoltage reference (A)	8B		
RNG	CC-mode range select (D)	8C		
R268-6	Resistor pin number	4B, 5D		
R268-8	Resistor pin number	4B, 5D		
R267-2	Resistor pin number	4C, 8D		
R267-3	Resistor pin number	4C, 8C		
R267-10	Resistor pin number	4C, 6B		
+S	Remote + sense (A) (from rear-panel +S)	1D		
- S	Remote - sense (A) (from rear-panel - S)	1D		
SPCLR*	Secondary-circuit power-on clear (D)	1B		
TEMP1	Power-board temperature (A)		8A	
TURNON	Power-on input disable (D)	**1B**	8C	
UNREG	Input to unregulated-input comparator (A)	8C, 4C	**2C**	
UNREG*	Unregulated-input status (D)	**8A**		
VMON*	Input-voltage monitor signal (A)	**8D**		
VOFF	Voltage off	5D	2B	
+12V_REF	Reference for overvoltage circuit (A)	1C		

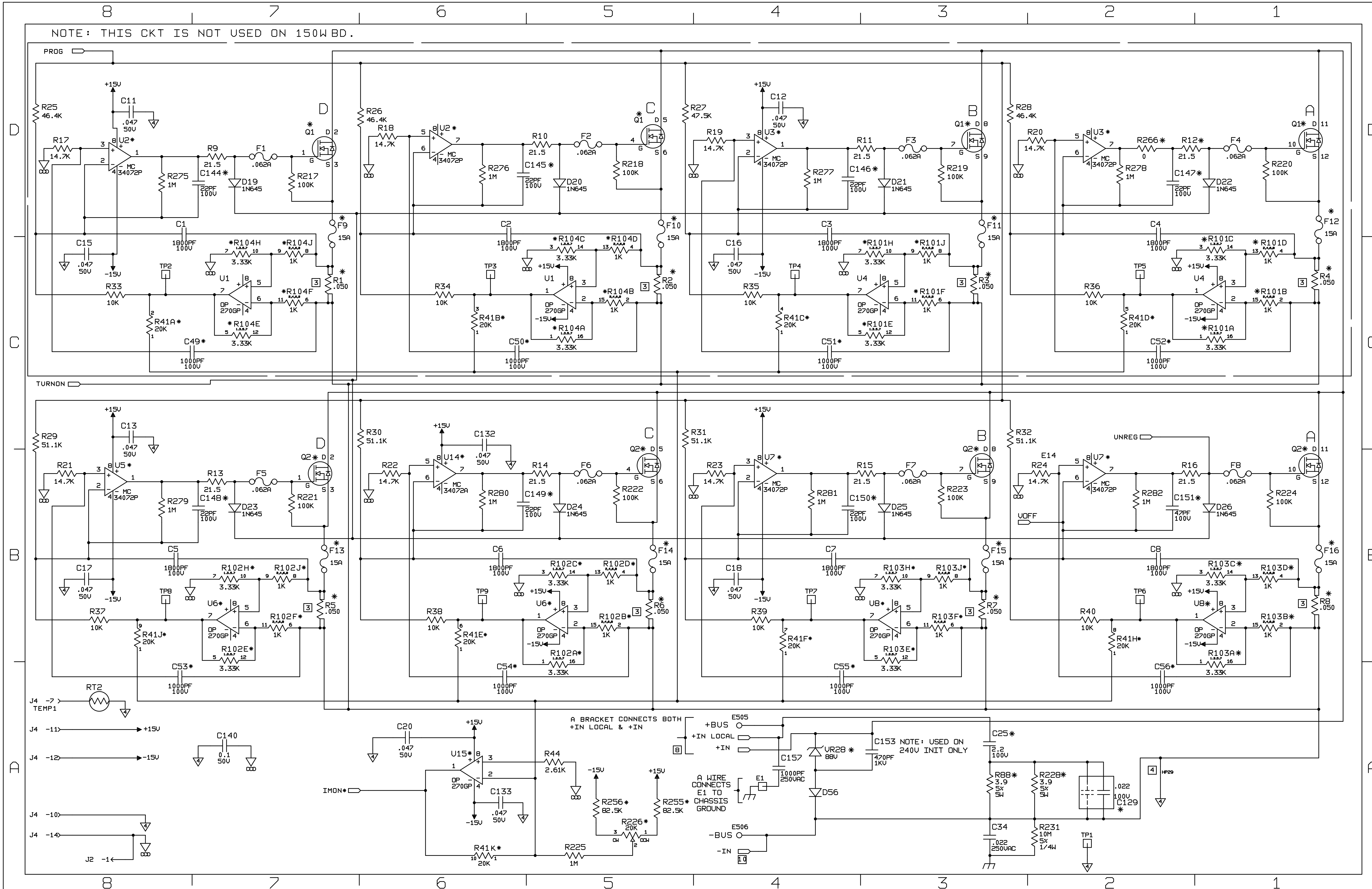
(A) = analog signal (D) = digital signal **8C** = signal origin



RT2
Q2
Q1
Q9
Q10
Q11
Q12
R4
D56
F12
C153
VR28
F13
F14
F15
F16
F9
F10
F11
R5
R6
R7
R8
R1
R2
R3
R96
C156
R271
R283
C155
R249
R270
D57
VR29
R290
C135
C128
R268
U10
R209
R267
R142
R212
U12
R102
R103
R104
R101
R88
R228
C120
C131
R264
E2
E3
R265
S1
R55
R54
R91
R215
R229
C25
C143
C97
D18
C138
C95
C96
U5
U6
U7
U8
U9
U2
U1
U3
U4
U11
U13
U14
U15
U16
VR26
R211
VR10
R46
R257
C130
Q126
C157
R231
R53
R252
R238
R230
C34
J4
R226
R143
R136
R255
R256
R289
R109
D33
C36
R41
C137
D62
R285
D60
R269
C154
C140
R266
R233
R108
R272
R284
C106
C35
D58
C60
C125
R95
C141
R207
C39
R43
R234
R235
J2
E1

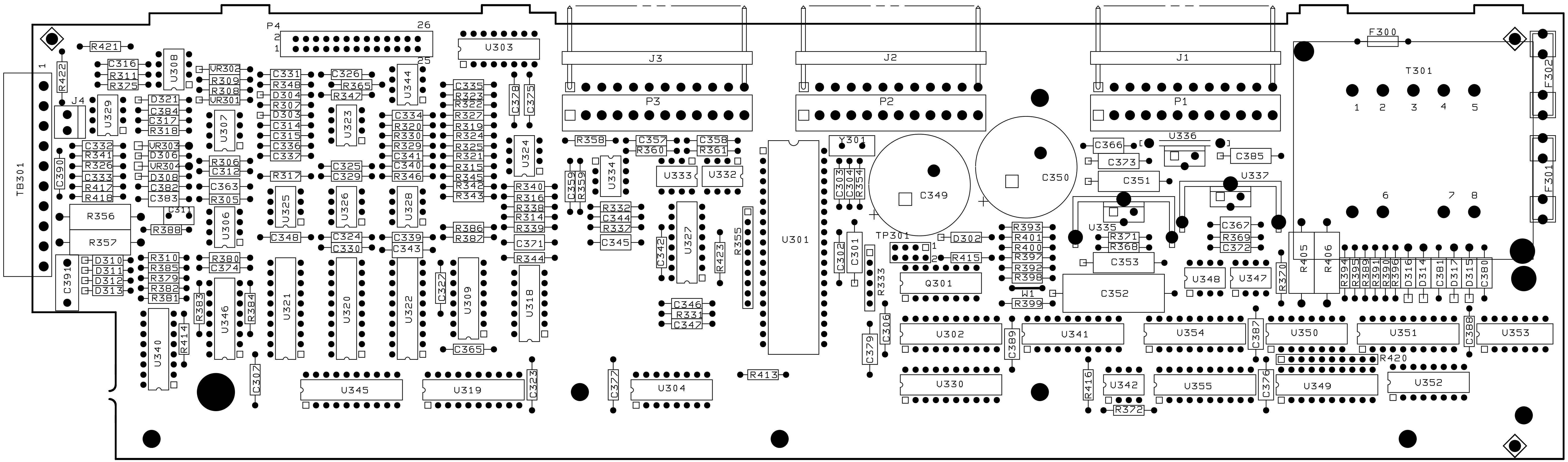


8 7 6 5 4 3 2 1
D C B A
J4 -15 VMON*
R105* 10K .1%
J4 -5 CV PROG
R117* 10K .1%
C36 1 50V
E8
R270 4.32K
R271 11K
U12 MC 34072P
R267-2
R267-3
D57
R272* 82.5K
E7
R107* 12.7K
U13*
C14 .047 50V
D33
C136 .047 50V
C35 .047 50V
R106 60.4K
E11
C106 .022 100V
R201 8.25K
R202* 2K
R108 5.11K
R109 20K
R143 1.5K
D28 1N645
R136 20K
R289 340K
R110 31.6K
D60 1N645
R283 1.5M
VOFF
C156 1200PF 100V
R288 1.5M
PROG
R268-6
R268-8
C138 150PF 100V
U17 LM358N
C33 .047 50V
R65 5.11K
+0.V
D17 1N645
R64 36.5K
D18 1N645
C134* 100PF 100V
R252* 0
R53* 60K.1%
R56* 10K .1%
U14* MC 34072A
R54* 60K.1%
R55* 10K .1%
C19 .047 50V
C130* .047 100V
R229 4.7 5% 1/4W
S1
E2 E3
R265 0
R264 0
J4 -1 +S
J4 -4 -S
LOCAL
REMOTE
-IN
+IN LOCAL
C131 .047 100V
R230 4.7 5% 1/4W
R204 200K
U16*
R207 200K
R206* 365
C141* 0.1 50V
D59
VR29
J4 -13 CC PROG E3
J4 -18 RNG
U9 DG211
R68* 20K .1%
R50 51.1K
J4 -22 +5
R205* 6.81K
R69* 2.222K .1%
U12 MC 34072P
R267-10
C155 .047 50V
E2
UNREG E1
IMON*
J2 -3
J4 -6 IMON*
J4 -19 CR*
E10
R208 5.11K
C125* .022 100V
UNREG
R284 9.31K
R285 90.9K
D62
R66 2.15K
U15* OP 270GP
R67 1.5K
D27 1N645
C60 .022 100V
D63 1N3595
D58
R274 1.21K
C26* 4700PF 100V
E12
R71* 2K .1%
R267
E1 UNREG
CC PROG
5.11K 10K 10K 16.2K 6.81K 7.5K 14.7K 2.15K
C128 .047 50V
-15VX
R58* 33K
D35 1N645
R238 1K
U5* MC 34072P
D55 1N645
C143 220PF 100V
R213* 42.2K
R214* 42.2K
C126 .22 50V
R59* 47.5K
R144 14K
Q11 2N2907A
J4 -9 +12V REF
PROG
D54 1N645
R234 3.16K
Q12
R235 6.81K
R91* 0
R215* 75K
D53 1N645
R216 1.78K
C142 .022 100V
R239 162
R60 576
VR27 6.2V
+IN LOCAL
R43 10.0K
J4 -21 SPCLR*
R151 31.6K
BO*
TURNON
Q9 2N4392
VR10 16V
Q10
R46 5.11K
R257 10K
J4 -17 ACLR*
D10 1N645
VR26 9.09V 5%
R212 6.81K
R211 1.78K
C139 .01 100V
R116 200K
C38 .047 50V
R261 10K
R262 6.49K
R233 10K
R263 12.1K
U11 Iset V+ VE V-
J4 -26 OV*
J4 -25 BO*
J4 -24 OP*
J4 -23 UNREG*
+0.V
-0.P
+0.P
R269 10K
R259 10K
ACLR*
C154 .01 100V
C152 4700PF 100V
C137 .01 100V
R114 16.2K
R115 511
C39 .047 50V
R96* 60K.1%
R249* 0
R90* 10K .1%
U17 LM358N
R93* 1.96K
C42 .047 50V
C41 .047 50V
C40 .047 50V
R94 20K
R92* 1.96K
R142
69.89K 100K 14.96K 51.74K 100K 129.9K 134.7K 55.7K 100K 15.95K 71.81K
U10
R268
31.6K 14K 1K 51.1K 51.1K
R290* 56.2K
D11 1N645
C135 2200PF 100V
C32 .047 50V
C127 0.1 50V
R95 1K
R209 4.7 5% 1/4W
C21 .047 50V
Q12-16
+IN
-IN
+5
+15V
-15V
-15VX

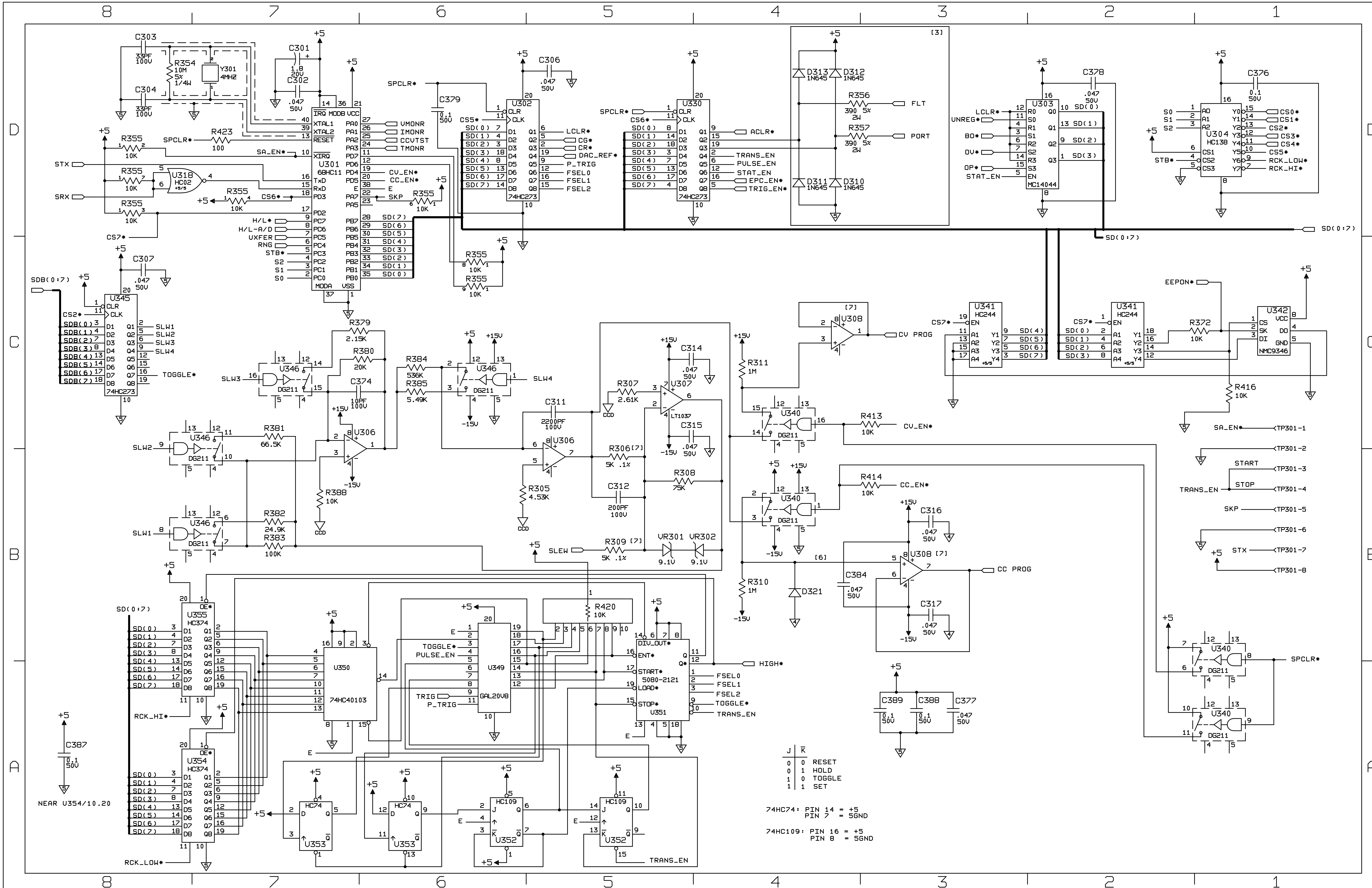

NOTE: THIS CKT IS NOT USED ON 150W BD.
PROG
TURNON
UNREG
VOFF
IMON*
J4 -7
TEMP1
RT2
J4 -11
+15V
J4 -12
-15V
J4 -10
J4 -14
J2 -1
C140
0.1
50V
A BRACKET CONNECTS BOTH
+IN LOCAL & +IN
+BUS
E505
+IN LOCAL
+IN
-BUS
E506
-IN
A WIRE
CONNECTS
E1 TO
CHASSIS
GROUND
C153 NOTE: USED ON
240V INIT ONLY
VR28
88V
D56
C157
1000PF
250VAC
470PF
1KV
C25*
2.2
100V
R88*
3.9
5%
5W
R228*
3.9
5%
5W
C129
.022
100V
C34
.022
250VAC
R231
10M
5%
1/4W
TP1
U15*
OP
270GP
R44
2.61K
C133
.047
50V
C20
.047
50V
R41K*
20K
R225
1M
R256*
82.5K
R255*
82.5K
R226*
20K
CW
CCW
Q1
Q2
MC
34072P
1N645
.062A
15A
.050
1800PF
100V
1000PF
100V
22PF
100V
47PF
100V
3.33K
1K
10K
20K
14.7K
21.5
100K
1M
46.4K
47.5K
51.1K

REF/DES	MODEL NUMBER		
	60502(60V)	60501(60V)	60503(240V)
R53	60 K .1%	60 K .1%	150K .1%
R54	60 K .1%	60 K .1%	300K .1%
R55	10 K .1%	10 K .1%	12.5K.1%
R56	10 K .1%	10 K .1%	12.5K.1%
R58	33 K	33K	31.6K
R59	47.5K	47.5K	45.3K
R90	10 K .1%	10 K .1%	12.5K .1%
R91	0	0	287K
R92	1.96K	1.96K	3.83K
R93	1.96K	1.96K	3.83K
R96	60 K .1%	60 K .1%	150K .1%
R97	0	0	1M
R105	10K	10K	5K
R107	12.7K	12.7K	5.11K
R117	10 K .1%	10 K .1%	5K
R205	6.81K	6.81K	1.87K
R206	365	365	100
R213	42.2K	42.2K	45.3K
R214	42.2K	42.2K	51.1K
R215	75K	75K	249K
C5-C8	1800PF	1800PF	1800PF
R249	0	0	150K .1%
R252	0	0	150K .1%
C151	47PF	33PF	33PF
C1-4	1800 PF100V	N/A	1800 PF100V
C11,12	0.047 50V	N/A	0.047 50V
C15,16	0.047 50V	N/A	0.047 50V
C25	2.2 100V	2.2 100V	1 400V
C49-52	330 PF 100V	N/A	330 PF 100V
C129	.022 100V	.022 100V	.02 500V
C130	0.047 100V	0.047 100V	.05 400V
C144-146	22 PF 100V	N/A	33 PF 100V
C147	22 PF 100V	N/A	33 PF 100V
C148-150	22 PF 100V	22 PF 100V	33 PF 100V
D1-4	1N645	N/A	1N645
D19-22	1N645	N/A	1N645
F1-4	0.062 A	N/A	0.062 A
F9-12	15 A	N/A	7A
F13-16	15 A	15 A	7A
Q1	4XIRF540	N/A	4XIRF740
Q2	4XIRF540	4XIRF540	4XIRF740
R1-4	0.050	N/A	0.30
R5-8	0.050	0.050	0.30
R9-11	21.5	N/A	21.5
R12	21.5	N/A	21.5
R17-20	14.7K	N/A	14.7K
R25,R26,	46.4K	N/A	46.4K
R28	46.4K	N/A	46.4K
R27	47.5K	N/A	47.5K
R33-36	10K	N/A	10K
R266	0	N/A	0
R88	3.9 5% 5W	3.9 5% 5W	4.3 5% 2W
R272	36.5K	36.5K	10 K
R217-220	100K	N/A	100K
R228	3.9 5% 5W	3.9 5% 5W	4.3 5% 2W
U1,4	OP270GP	OP270GP	OP270GP
VR28	88V 5%	88V 5%	300V 5%

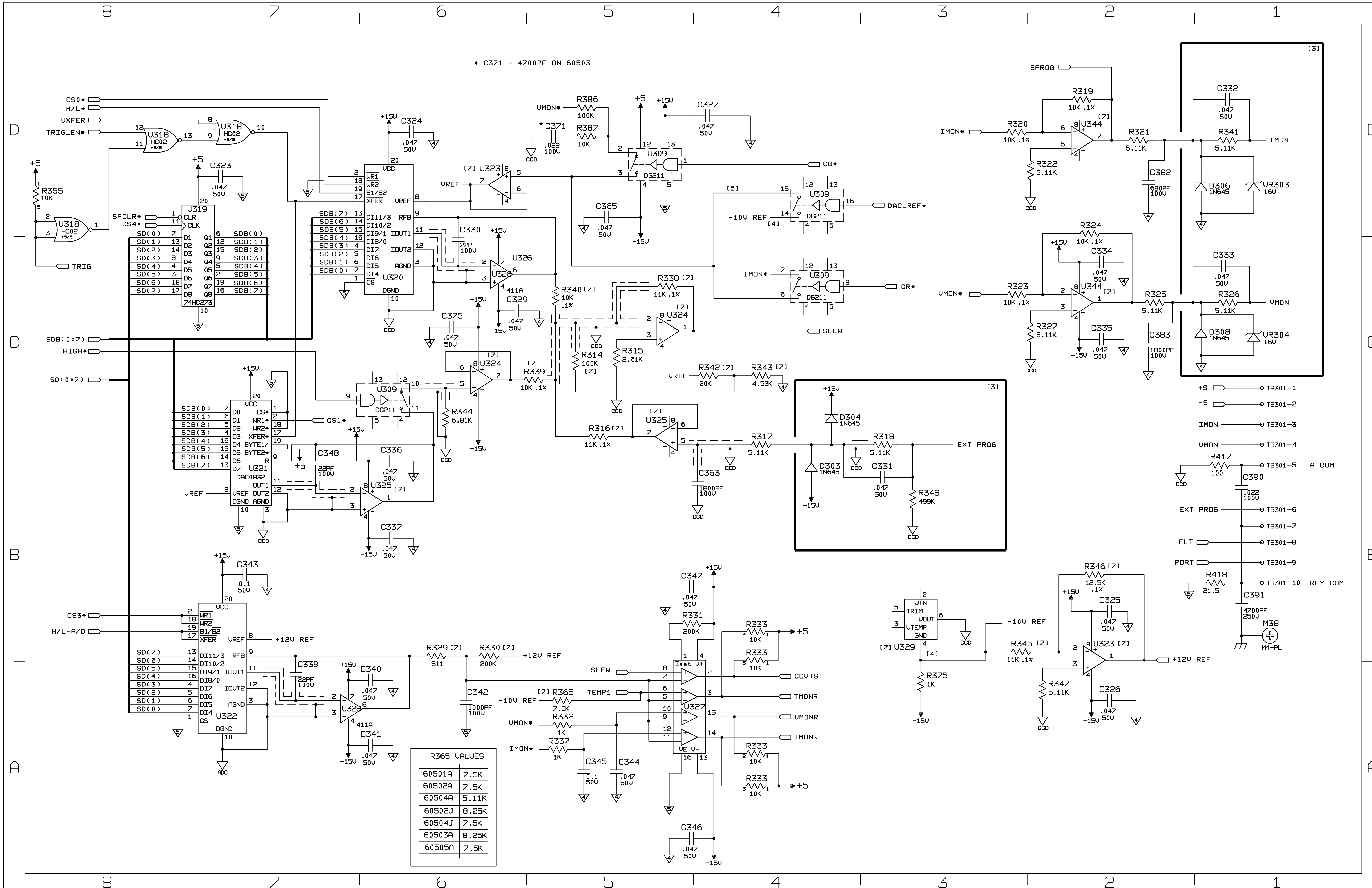
REF/DES	MODEL NUMBER		
	60502(60V)	60501(60V)	60503(240V)
U6,U8	OP270GP	OP270GP	OP270GP
U13	LF412	LF412	LF412
U16	LF412	LF412	LF412
U2,3	MC34072P	N/A	MC34072P
U14	MC34072A	MC34072A	MC34072A
U5,7	MC34072P	MC34072P	MC34072P
R41A	20K	N/A	20K
R41B	20K	N/A	20K
R41C	20K	N/A	20K
R41D	20K	N/A	20K
R41E	20K	10K	20K
R41F	20K	10K	20K
R41H	20K	10K	20K
R41J	20K	10K	20K
R41K	20K	20K	20K
R102A	3.33K	3.33K	3.33K
R102C	3.33K	3.33K	3.33K
R102E	3.33K	3.33K	3.33K
R102H	3.33K	3.33K	3.33K
R102B	1K	1K	1K
R102D	1K	1K	1K
R102F	1K	1K	1K
R102J	1K	1K	1K
R103A	3.33K	3.33K	3.33K
R103C	3.33K	3.33K	3.33K
R103E	3.33K	3.33K	3.33K
R103H	3.33K	3.33K	3.33K
R103B	1K	1K	1K
R103D	1K	1K	1K
R103F	1K	1K	1K
R103J	1K	1K	1K
R101A	3.33K	N/A	3.33K
R101C	3.33K	N/A	3.33K
R101E	3.33K	N/A	3.33K
R101H	3.33K	N/A	3.33K
R101B	1K	N/A	1K
R101D	1K	N/A	1K
R101F	1K	N/A	1K
R101J	1K	N/A	1K
R104A	3.33K	N/A	3.33K
R104C	3.33K	N/A	3.33K
R104E	3.33K	N/A	3.33K
R104H	3.33K	N/A	3.33K
R104B	1K	N/A	1K
R104D	1K	N/A	1K
R104F	1K	N/A	1K
R104J	1K	N/A	1K
R255	82.5K	82.5K	82.5K
R256	82.5K	82.5K	82.5K
R202	2K	2K	1.33K
C125	.022	.015	.015
U15	OP270GP	OP270GP	OP270GP
R290	56.2K	56.2K	51.1K
C141	.1	.1	N/A
C49-C56	1000PF	330PF	330PF



P4
26
2
1
25
U303
J3
J2
J1
F300
T301
1
2
3
4
5
6
7
8
F302
F301
TB301
R421
R422
J4
C316
R311
R375
U308
VR302
R309
R308
VR301
C331
R348
D304
R307
D303
C314
C315
C336
C337
C326
R365
R347
U344
U323
C335
R323
R322
R327
R319
R324
R325
R321
R345
R342
R343
C334
R320
R330
R329
C341
C340
R346
C378
C375
U324
D321
C384
C317
R318
U329
U307
C332
R341
R326
C333
R417
R418
C390
VR303
D306
VR304
D308
C382
C383
R306
C312
C363
R305
R317
C325
C329
U325
U326
U328
R340
R316
R338
R314
R339
C371
R344
R386
R387
R356
R357
C311
R388
U306
C348
C324
C330
C339
C343
D310
D311
D312
D313
C391
R310
R385
R379
R382
R381
R380
C374
R383
U346
R384
U321
U320
U322
C327
U309
U318
U340
R414
C307
C365
U345
U319
C323
R358
C359
R359
U334
C357
R360
C358
R361
U333
U332
R332
C344
R337
C345
C342
U327
R423
R355
C346
R331
C347
C377
U304
R413
P3
P2
P1
U301
Y301
C303
C304
R354
C349
C350
TP301
1
2
C302
C301
R333
D302
R415
Q301
C306
C379
U302
U330
R393
R401
R400
R397
R392
R398
W1
R399
C389
U341
R416
U342
R372
C366
C373
C351
U336
C385
U337
U335
R371
R368
C353
C352
C367
R369
C372
U348
U347
R370
U354
U355
C387
C376
U350
U349
R405
R406
R394
R395
R389
R391
R390
R396
D316
D314
C381
D317
D315
C380
U351
R420
U352
C388
U353

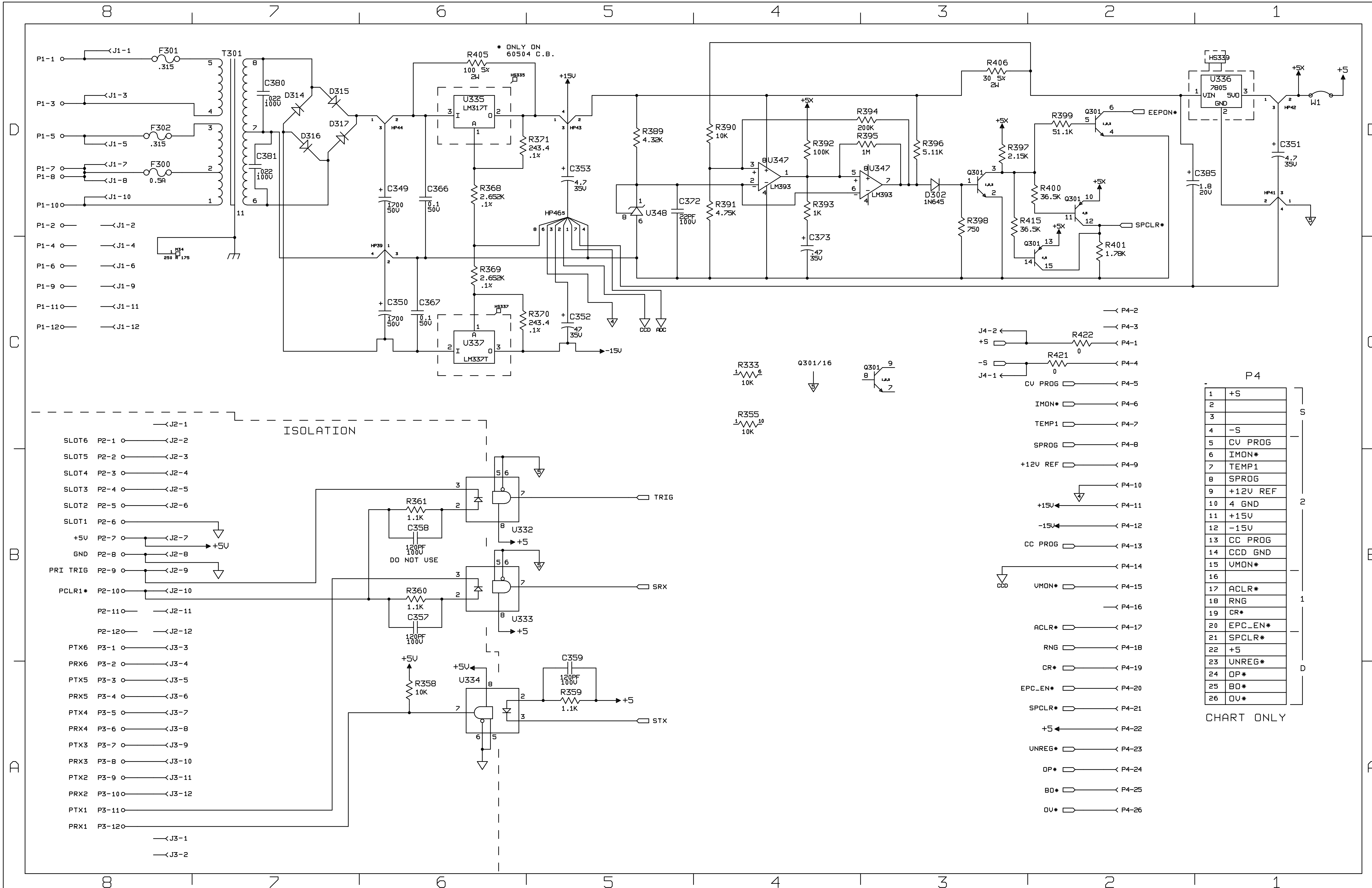


U301 68HC11
U302 74HC273
U330 74HC273
U303 MC14044
U304 HC138
U345 74HC273
U341 HC244
U342 NMC9346
U306
U307 LT1037
U308
U340 DG211
U346 DG211
U355 HC374
U354 HC374
U350 74HC40103
U349 GAL20V8
U351 5080-2121
U353 HC74
U352 HC109
Y301 4MHZ
SD(0:7)
SDB(0:7)
CV PROG
CC PROG
FLT
PORT
SPCLR*
HIGH*
NEAR U354/10.20
J K
0 0 RESET
0 1 HOLD
1 0 TOGGLE
1 1 SET
74HC74: PIN 14 = +5
PIN 7 = 5GND
74HC109: PIN 16 = +5
PIN 8 = 5GND
TP301-1
TP301-2
TP301-3
TP301-4
TP301-5
TP301-6
TP301-7
TP301-8



* C371 - 4700PF ON 60503

R365 VALUES	
60501A	7.5K
60502A	7.5K
60504A	5.11K
60502J	8.25K
60504J	7.5K
60503A	8.25K
60505A	7.5K



* ONLY ON 60504 C.B.
P1-1
J1-1
F301 .315
T301
P1-3
J1-3
P1-5
F302 .315
J1-5
P1-7
P1-8
J1-7
J1-8
F300 0.5A
P1-10
J1-10
P1-2
J1-2
P1-4
J1-4
P1-6
J1-6
P1-9
J1-9
P1-11
J1-11
P1-12
J1-12
C380 .022 100V
C381 .022 100V
D314
D315
D316
D317
HP44
R405 100 5% 2W
U335 LM317T
HS335
R371 243.4 .1%
R368 2.652K .1%
R369 2.652K .1%
R370 243.4 .1%
HS337
U337 LM337T
C349 1700 50V
C366 0.1 50V
C350 1700 50V
C367 0.1 50V
HP39
+15V
HP43
C353 4.7 35V
HP46
C352 47 35V
-15V
CCD
ADC
R389 4.32K
U348
C372 22PF 100V
R390 10K
R391 4.75K
U347 LM393
+5X
R392 100K
R393 1K
C373 .47 35V
R394 200K
R395 1M
R396 5.11K
D302 1N645
R398 750
R406 30 5% 2W
Q301
R397 2.15K
R399 51.1K
R400 36.5K
R415 36.5K
R401 1.78K
EEPON*
SPCLR*
HS339
U336 7805
VIN 5VO GND
C385 1.8 20V
C351 4.7 35V
HP42
HP41
W1
+5
R333 10K
R355 10K
Q301/16
ISOLATION
J2-1
SLOT6 P2-1 J2-2
SLOT5 P2-2 J2-3
SLOT4 P2-3 J2-4
SLOT3 P2-4 J2-5
SLOT2 P2-5 J2-6
SLOT1 P2-6
+5V P2-7 J2-7
GND P2-8 J2-8
PRI TRIG P2-9 J2-9
PCLR1* P2-10 J2-10
P2-11 J2-11
P2-12 J2-12
PTX6 P3-1 J3-3
PRX6 P3-2 J3-4
PTX5 P3-3 J3-5
PRX5 P3-4 J3-6
PTX4 P3-5 J3-7
PRX4 P3-6 J3-8
PTX3 P3-7 J3-9
PRX3 P3-8 J3-10
PTX2 P3-9 J3-11
PRX2 P3-10 J3-12
PTX1 P3-11
PRX1 P3-12
J3-1
J3-2
R361 1.1K
C358 120PF 100V
DO NOT USE
U332
TRIG
R360 1.1K
C357 120PF 100V
U333
SRX
R358 10K
U334
C359 120PF 100V
R359 1.1K
STX
J4-2
+S
R422 0
-S
R421 0
J4-1
P4-1 P4-2 P4-3 P4-4
CV PROG P4-5
IMON* P4-6
TEMP1 P4-7
SPROG P4-8
+12V REF P4-9
P4-10
+15V P4-11
-15V P4-12
CC PROG P4-13
P4-14
VMON* P4-15
P4-16
ACLR* P4-17
RNG P4-18
CR* P4-19
EPC_EN* P4-20
SPCLR* P4-21
+5 P4-22
UNREG* P4-23
OP* P4-24
BO* P4-25
OV* P4-26
P4
1 +S
2
3
4 -S
5 CV PROG
6 IMON*
7 TEMP1
8 SPROG
9 +12V REF
10 4 GND
11 +15V
12 -15V
13 CC PROG
14 CCD GND
15 VMON*
16
17 ACLR*
18 RNG
19 CR*
20 EPC_EN*
21 SPCLR*
22 +5
23 UNREG*
24 OP*
25 BO*
26 OV*
S
2
1
D
CHART ONLY